

SEQUENCE LISTING

<110> OHTAKI, Hiromi
 NAKAMURA, Jun
 IZUI, Hiroshi
 NAKAMATSU, Tsuyoshi

<120> Bacterium Producing L-Glutamic Acid and Method for Producing L-Glutamic Acid

<130> OP1195

<140>

<141> 2000-07-

<150> JP 2000-204256

<151> 2000-07-05

<160> 34

<170> PatentIn Ver. 2.0

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 T021040-28E56860

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 aaaatcaacc tgcttaggcg tctttcgctt aaatagcgta gaatatcggg tcgacgctt 120
 ttaaactc agaggatcc ttgccggcca aaatcacgga cactcgcccc accccagaat 180
 cccttcacgc tgttgaagag gaaaccgcag ccggtgcccc caggattgtt gccacctatt 240
 ctaaggactt cttcgacggc gtcactttga tgtgcatgct cggcggtgaa cctcagggcc 300
 tgcgttacac caaggtcgct tctgaacacg aggaagctca gccaaagaag gctacaaagc 360
 ggactcgtaa ggctaccagc taagaaggct gctgctaaga aaacgaccaa gaagaccact 420
 aagaaaacta ctaaaaagac caccgcaaag aagaccacaa agaagtctta agccggatct 480
 tat atg gat gat tcc aat agc ttt gta gtt gtt gct aac cgt ctg cca 528
 Met Asp Asp Ser Asn Ser Phe Val Val Val Ala Asn Arg Leu Pro

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1	5	10	15	
gtg gat atg act gtc cac cca gat ggt agc tat agc atc tcc ccc agc	576			
Val Asp Met Thr Val His Pro Asp Gly Ser Tyr Ser Ile Ser Pro Ser				
20	25	30		
ccc ggt ggc ctt gtc acg ggg ctt tcc ccc gtt ctg gaa caa cat cgt	624			
Pro Gly Gly Leu Val Thr Gly Leu Ser Pro Val Leu Glu Gln His Arg				
35	40	45		
gga tgt tgg gtc gga tgg cct gga act gta gat gtt gca ccc gaa cca	672			
Gly Cys Trp Val Gly Trp Pro Gly Thr Val Asp Val Ala Pro Glu Pro				
50	55	60		
ttt cga aca gat acg ggt gtt ttg ctg cac cct gtt gtc ctc act gca	720			
Phe Arg Thr Asp Thr Gly Val Leu Leu His Pro Val Val Leu Thr Ala				
65	70	75		
agt gac tat gaa ggc ttc tac gag ggc ttt tca aac gca acg ctg tgg	768			
Ser Asp Tyr Glu Gly Phe Tyr Glu Gly Phe Ser Asn Ala Thr Leu Trp				
80	85	90	95	
cct ctt ttc cac gat ctg att gtt act ccg gtg tac aac acc gat tgg	816			
Pro Leu Phe His Asp Leu Ile Val Thr Pro Val Tyr Asn Thr Asp Trp				
100	105	110		
tgg cat gcg ttt cgg gaa gta aac ctc aag ttc gct gaa gcc gtg agc	864			
Trp His Ala Phe Arg Glu Val Asn Leu Lys Phe Ala Glu Ala Val Ser				
115	120	125		
caa gtg gcg gca cac ggt gcc act gtg tgg gtg cag gac tat cag ctg	912			
Gln Val Ala Ala His Gly Ala Thr Val Trp Val Gln Asp Tyr Gln Leu				
130	135	140		
ttg ctg gtt cct ggc att ttg cgc cag atg cgc ctt gat ttg aag atc	960			
Leu Leu Val Pro Gly Ile Leu Arg Gln Met Arg Leu Asp Leu Lys Ile				
145	150	155		
ggt ttc ttc ctc cac att ccc ttc cct tcc cct gat ctg ttc cgt cag	1008			
Gly Phe Phe Leu His Ile Pro Phe Pro Ser Pro Asp Leu Phe Arg Gln				
160	165	170	175	
ctg ccg tgg cgt gaa gag att gtt cga ggc atg ctg ggc gca gat ttg	1056			
Leu Pro Trp Arg Glu Glu Ile Val Arg Gly Met Leu Gly Ala Asp Leu				
180	185	190		
gtg gga ttc cat ttg gtt caa aac gca gaa aac ttc ctt gcg tta acc	1104			
Val Gly Phe His Leu Val Gln Asn Ala Glu Asn Phe Leu Ala Leu Thr				
195	200	205		
cag cag gtt gcc ggc act gcc ggg tct cat gtg ggt cag ccg gac acc	1152			
Gln Gln Val Ala Gly Thr Ala Gly Ser His Val Gly Gln Pro Asp Thr				
210	215	220		
ttg cag gtc agt ggt gaa gca ttg gtg cgt gag att ggc gct cat gtt	1200			

T0202023E5680

Leu	Gln	Val	Ser	Gly	Glu	Ala	Leu	Val	Arg	Glu	Ile	Gly	Ala	His	Val		
225						230					235						
gaa	acc	gct	gac	gga	agg	cga	gtt	agc	gtc	ggg	gcg	ttc	ccg	atc	tcg	1248	
Glu	Thr	Ala	Asp	Gly	Arg	Arg	Val	Ser	Val	Gly	Ala	Phe	Pro	Ile	Ser		
240					245					250					255		
att	gat	gtt	gaa	atg	ttt	ggg	gag	gcg	tcg	aaa	agc	gcc	gtt	ctt	gat	1296	
Ile	Asp	Val	Glu	Met	Phe	Gly	Glu	Ala	Ser	Lys	Ser	Ala	Val	Leu	Asp		
			260						265					270			
ctt	tta	aaa	acg	ctc	gac	gag	ccg	gaa	acc	gta	ttc	ctg	ggc	gtt	gac	1344	
Leu	Leu	Lys	Thr	Leu	Asp	Glu	Pro	Glu	Thr	Val	Phe	Leu	Gly	Val	Asp		
			275					280					285				
cga	ctg	gac	tac	acc	aag	ggc	att	ttg	cag	cgc	ctg	ctt	gcg	ttt	gag	1392	
Arg	Leu	Asp	Tyr	Thr	Lys	Gly	Ile	Leu	Gln	Arg	Leu	Leu	Ala	Phe	Glu		
		290					295					300					
gaa	ctg	ctg	gaa	tcc	ggc	gcg	ttg	gag	gcc	gac	aaa	gct	gtg	ttg	ctg	1440	
Glu	Leu	Leu	Glu	Ser	Gly	Ala	Leu	Glu	Ala	Asp	Lys	Ala	Val	Leu	Leu		
		305				310					315						
cag	gtc	gcg	acg	cct	tcg	cgt	gag	cgc	att	gat	cac	tat	cgt	gtg	tcg	1488	
Gln	Val	Ala	Thr	Pro	Ser	Arg	Glu	Arg	Ile	Asp	His	Tyr	Arg	Val	Ser		
320					325					330					335		
cgt	tcg	cag	gtc	gag	gaa	gcc	gtc	ggc	cgt	atc	aat	ggt	cgt	ttc	ggt	1536	
Arg	Ser	Gln	Val	Glu	Glu	Ala	Val	Gly	Arg	Ile	Asn	Gly	Arg	Phe	Gly		
			340					345					350				
cgc	atg	ggg	cgt	ccc	gtg	gtg	cat	tat	cta	cac	agg	tca	ttg	agc	aaa	1584	
Arg	Met	Gly	Arg	Pro	Val	Val	His	Tyr	Leu	His	Arg	Ser	Leu	Ser	Lys		
			355					360					365				
aat	gat	ctc	cag	gtg	ctg	tat	acc	gca	gcc	gat	gtc	atg	ctg	gtt	acg	1632	
Asn	Asp	Leu	Gln	Val	Leu	Tyr	Thr	Ala	Ala	Asp	Val	Met	Leu	Val	Thr		
		370					375					380					
cct	ttt	aaa	gac	ggt	atg	aac	ttg	gtg	gct	aaa	gaa	ttc	gtg	gcc	aac	1680	
Pro	Phe	Lys	Asp	Gly	Met	Asn	Leu	Val	Ala	Lys	Glu	Phe	Val	Ala	Asn		
		385				390					395						
cac	cgc	gac	ggc	act	ggt	gct	ttg	gtg	ctg	tcc	gaa	ttt	gcc	ggc	gcg	1728	
His	Arg	Asp	Gly	Thr	Gly	Ala	Leu	Val	Leu	Ser	Glu	Phe	Ala	Gly	Ala		
400					405				410					415			
gcc	act	gag	ctg	acc	ggt	gcg	tat	tta	tgc	aac	cca	ttt	gat	gtg	gaa	1776	
Ala	Thr	Glu	Leu	Thr	Gly	Ala	Tyr	Leu	Cys	Asn	Pro	Phe	Asp	Val	Glu		
			420					425					430				
tcc	atc	aaa	cgg	caa	atg	gtg	gca	gct	gtc	cat	gat	ttg	aag	cac	aat	1824	
Ser	Ile	Lys	Arg	Gln	Met	Val	Ala	Ala	Val	His	Asp	Leu	Lys	His	Asn		
			435				440						445				

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ccg gaa tct gcg gca acg cga atg aaa acg aac agc gag cag gtc tat 1872
 Pro Glu Ser Ala Ala Thr Arg Met Lys Thr Asn Ser Glu Gln Val Tyr
 450 455 460
 acc cac gac gtc aac gtg tgg gct aat agt ttc ctg gat tgt ttg gcg 1920
 Thr His Asp Val Asn Val Trp Ala Asn Ser Phe Leu Asp Cys Leu Ala
 465 470 475
 cag tcg gga gaa aac tca tgaaccgcgc acgaatcgcg accataggcg 1968
 Gln Ser Gly Glu Asn Ser
 480 485
 ttcttccgct tgctttactg ctggcgctct gtggttcaga caccgtggaa atgacagatt 2028
 ccacctggtt ggtgaccaat atttacaccg atccagatga gtcgaattcg atcagtaatc 2088
 ttgtcatttc ccagcccagc ttagattttg gcaattcttc cctgtctggt ttcactggct 2148
 gtgtgccttt tacggggcgt gcggaattct tccaaaatgg tgagcaaagc tctgttctgg 2208
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 gacaagaact caaagtcat aacgagctgg ttgatcttct gcctggttct ttgaaatct 2328
 ccaggacttc tggttcagaa atcttgctga ctagcgatgt c 2369

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<211> 485

<212> PRT

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			20					25					30		
Gly	Gly	Leu	Val	Thr	Gly	Leu	Ser	Pro	Val	Leu	Glu	Gln	His	Arg	Gly
		35				40						45			
Cys	Trp	Val	Gly	Trp	Pro	Gly	Thr	Val	Asp	Val	Ala	Pro	Glu	Pro	Phe
	50					55				60					
Arg	Thr	Asp	Thr	Gly	Val	Leu	Leu	His	Pro	Val	Val	Leu	Thr	Ala	Ser
	65				70					75				80	
Asp	Tyr	Glu	Gly	Phe	Tyr	Glu	Gly	Phe	Ser	Asn	Ala	Thr	Leu	Trp	Pro
			85					90					95		
Leu	Phe	His	Asp	Leu	Ile	Val	Thr	Pro	Val	Tyr	Asn	Thr	Asp	Trp	Trp
			100					105					110		
His	Ala	Phe	Arg	Glu	Val	Asn	Leu	Lys	Phe	Ala	Glu	Ala	Val	Ser	Gln
		115					120					125			
Val	Ala	Ala	His	Gly	Ala	Thr	Val	Trp	Val	Gln	Asp	Tyr	Gln	Leu	Leu
		130					135					140			

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Leu Val Pro Gly Ile Leu Arg Gln Met Arg Leu Asp Leu Lys Ile Gly
 145 150 155 160
 Phe Phe Leu His Ile Pro Phe Pro Ser Pro Asp Leu Phe Arg Gln Leu
 165 170 175
 Pro Trp Arg Glu Glu Ile Val Arg Gly Met Leu Gly Ala Asp Leu Val
 180 185 190
 Gly Phe His Leu Val Gln Asn Ala Glu Asn Phe Leu Ala Leu Thr Gln
 195 200 205
 Gln Val Ala Gly Thr Ala Gly Ser His Val Gly Gln Pro Asp Thr Leu
 210 215 220
 Gln Val Ser Gly Glu Ala Leu Val Arg Glu Ile Gly Ala His Val Glu
 225 230 235 240
 Thr Ala Asp Gly Arg Arg Val Ser Val Gly Ala Phe Pro Ile Ser Ile
 245 250 255
 Asp Val Glu Met Phe Gly Glu Ala Ser Lys Ser Ala Val Leu Asp Leu
 260 265 270
 Leu Lys Thr Leu Asp Glu Pro Glu Thr Val Phe Leu Gly Val Asp Arg
 275 280 285
 Leu Asp Tyr Thr Lys Gly Ile Leu Gln Arg Leu Leu Ala Phe Glu Glu
 290 295 300
 Leu Leu Glu Ser Gly Ala Leu Glu Ala Asp Lys Ala Val Leu Leu Gln
 305 310 315 320
 Val Ala Thr Pro Ser Arg Glu Arg Ile Asp His Tyr Arg Val Ser Arg
 325 330 335
 Ser Gln Val Glu Glu Ala Val Gly Arg Ile Asn Gly Arg Phe Gly Arg
 340 345 350
 Met Gly Arg Pro Val Val His Tyr Leu His Arg Ser Leu Ser Lys Asn
 355 360 365
 Asp Leu Gln Val Leu Tyr Thr Ala Ala Asp Val Met Leu Val Thr Pro
 370 375 380
 Phe Lys Asp Gly Met Asn Leu Val Ala Lys Glu Phe Val Ala Asn His
 385 390 395 400
 Arg Asp Gly Thr Gly Ala Leu Val Leu Ser Glu Phe Ala Gly Ala Ala
 405 410 415
 Thr Glu Leu Thr Gly Ala Tyr Leu Cys Asn Pro Phe Asp Val Glu Ser
 420 425 430
 Ile Lys Arg Gln Met Val Ala Ala Val His Asp Leu Lys His Asn Pro
 435 440 445
 Glu Ser Ala Ala Thr Arg Met Lys Thr Asn Ser Glu Gln Val Tyr Thr
 450 455 460
 His Asp Val Asn Val Trp Ala Asn Ser Phe Leu Asp Cys Leu Ala Gln

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465 470 475 480
 Ser Gly Glu Asn Ser
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<210> 31
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 Met Ala Arg Pro Ile Ser Ala Thr Tyr Arg
 1 5 10
 ctt caa atg cga gga cct caa gca gat agc gcc ggg cgt ttc ttt ggt 159
 Leu Gln Met Arg Gly Pro Gln Ala Asp Ser Ala Gly Arg Phe Phe Gly
 15 20 25
 ttt gcg cag gcc aaa gcc cag ctt ccc tat ctg aag aag cta ggc atc 207
 Phe Ala Gln Ala Lys Ala Gln Leu Pro Tyr Leu Lys Lys Leu Gly Ile
 30 35 40
 agc cac ctg tac ctc tcc cct att ttt acg gcc atg cca gat tcc aat 255
 Ser His Leu Tyr Leu Ser Pro Ile Phe Thr Ala Met Pro Asp Ser Asn
 45 50 55
 cat ggc tac gat gtc att gat ccc acc gcc atc aat gaa gag ctc ggt 303
 His Gly Tyr Asp Val Ile Asp Pro Thr Ala Ile Asn Glu Glu Leu Gly
 60 65 70
 ggc atg gag ggt ctt cga gat ctt gct gca gct aca cac gag ttg ggc 351
 Gly Met Glu Gly Leu Arg Asp Leu Ala Ala Ala Thr His Glu Leu Gly
 75 80 85 90
 atg ggc atc atc att gat att gtt ccc aac cat tta ggt gtt gcc gtt 399
 Met Gly Ile Ile Ile Asp Ile Val Pro Asn His Leu Gly Val Ala Val
 95 100 105

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Pro His Leu Asn Pro Trp Trp Trp Asp Val Leu Lys Asn Gly Lys Asp	
110 115 120	
tcc gct ttt gag ttc tat ttc gat att gac tgg cac gaa gac aac ggt	495
Ser Ala Phe Glu Phe Tyr Phe Asp Ile Asp Trp His Glu Asp Asn Gly	
125 130 135	
tct ggt ggc aag ctg ggc atg ccg att ctg ggt gct gaa ggc gat gaa	543
Ser Gly Gly Lys Leu Gly Met Pro Ile Leu Gly Ala Glu Gly Asp Glu	
140 145 150	
gac aag ctg gaa ttc gcg gag ctt gat gga gag aaa gtg ctc aaa tat	591
Asp Lys Leu Glu Phe Ala Glu Leu Asp Gly Glu Lys Val Leu Lys Tyr	
155 160 165 170	
ttt gac cac ctc ttc cca atc gcg cct ggt acc gaa gaa ggg aca ccg	639
Phe Asp His Leu Phe Pro Ile Ala Pro Gly Thr Glu Glu Gly Thr Pro	
175 180 185	
caa gaa gtc tac aag cgc cag cat tac cgc ctg cag ttc tgg cgc gac	687
Gln Glu Val Tyr Lys Arg Gln His Tyr Arg Leu Gln Phe Trp Arg Asp	
190 195 200	
ggc gtg atc aac ttc cgt cgc ttc ttt tcc gtg aat acg ttg gct ggc	735
Gly Val Ile Asn Phe Arg Arg Phe Phe Ser Val Asn Thr Leu Ala Gly	
205 210 215	
atc agg caa gaa gat ccc ttg gtg ttt gaa cat act cat cgt ctg ctg	783
Ile Arg Gln Glu Asp Pro Leu Val Phe Glu His Thr His Arg Leu Leu	
220 225 230	
cgc gaa ttg gtg gcg gaa gac ctc att gac ggc gtg cgc gtc gat cac	831
Arg Glu Leu Val Ala Glu Asp Leu Ile Asp Gly Val Arg Val Asp His	
235 240 245 250	
ccc gac ggg ctt tcc gat cct ttt gga tat ctg cac aga ctc cgc gac	879
Pro Asp Gly Leu Ser Asp Pro Phe Gly Tyr Leu His Arg Leu Arg Asp	
255 260 265	
ctc att gga cct gac cgc tgg ctg atc atc gaa aag atc ttg agc gtt	927
Leu Ile Gly Pro Asp Arg Trp Leu Ile Ile Glu Lys Ile Leu Ser Val	
270 275 280	
gat gaa cca ctc gat ccc cgc ctg gcc gtt gat ggc acc act ggc tac	975
Asp Glu Pro Leu Asp Pro Arg Leu Ala Val Asp Gly Thr Thr Gly Tyr	
285 290 295	
gac ccc ctc cgt gaa ctc gac ggc gtg ttt atc tcc cga gaa tct gag	1023
Asp Pro Leu Arg Glu Leu Asp Gly Val Phe Ile Ser Arg Glu Ser Glu	
300 305 310	
gac aaa ttc tcc atg ttg gcg ctg acc cac agt gga tcc acc tgg gat	1071
Asp Lys Phe Ser Met Leu Ala Leu Thr His Ser Gly Ser Thr Trp Asp	

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315	320	325	330	
gaa cgc gcc cta aaa tcc acg gag gaa agc ctc aaa cga gtc gtc gcg				1119
Glu Arg Ala Leu Lys Ser Thr Glu Glu Ser Leu Lys Arg Val Val Ala				
335	340	345		
caa caa gaa ctc gca gcc gaa atc tta agg ctc gcc cgc gcc atg cgc				1167
Gln Gln Glu Leu Ala Ala Glu Ile Leu Arg Leu Ala Arg Ala Met Arg				
350	355	360		
cgc gat aac ttc tcc acc gca ggc acc aac gtc acc gaa gac aaa ctt				1215
Arg Asp Asn Phe Ser Thr Ala Gly Thr Asn Val Thr Glu Asp Lys Leu				
365	370	375		
agc gaa acc atc atc gaa tta gtc gcc gcc atg ccc gtc tac cgc gcc				1263
Ser Glu Thr Ile Ile Glu Leu Val Ala Ala Met Pro Val Tyr Arg Ala				
380	385	390		
gac tac atc tcc ctc tca cgc acc acc gcc acc gtc atc gcg gag atg				1311
Asp Tyr Ile Ser Leu Ser Arg Thr Thr Ala Thr Val Ile Ala Glu Met				
395	400	405	410	
tcc aaa cgc ttc ccc tcc cgg cgc gac gca ctc gac ctc atc tcg gcc				1359
Ser Lys Arg Phe Pro Ser Arg Arg Asp Ala Leu Asp Leu Ile Ser Ala				
415	420	425		
gcc cta ctt ggc aat ggc gag gcc aaa atc cgc ttc gcc caa gtc tgc				1407
Ala Leu Leu Gly Asn Gly Glu Ala Lys Ile Arg Phe Ala Gln Val Cys				
430	435	440		
ggc gcc gtc atg gcc aaa ggt gtg gaa gac acc acc ttc tac cgc gca				1455
Gly Ala Val Met Ala Lys Gly Val Glu Asp Thr Thr Phe Tyr Arg Ala				
445	450	455		
tct agg ctc gtt gca ctg caa gaa gtc ggt ggc gcg ccg ggc agg ttc				1503
Ser Arg Leu Val Ala Leu Gln Glu Val Gly Gly Ala Pro Gly Arg Phe				
460	465	470		
ggc gtc tcc gct gca gaa ttc cac ttg ctg cag gaa gaa cgc agc ctg				1551
Gly Val Ser Ala Ala Glu Phe His Leu Leu Gln Glu Glu Arg Ser Leu				
475	480	485	490	
ctg tgg cca cgc acc atg acc acc ttg tcc acg cac gac acc aaa cgc				1599
Leu Trp Pro Arg Thr Met Thr Thr Leu Ser Thr His Asp Thr Lys Arg				
495	500	505		
ggc gaa gat acc cgc gcc cgc atc atc tcc ctg tcc gaa gtc ccc gat				1647
Gly Glu Asp Thr Arg Ala Arg Ile Ile Ser Leu Ser Glu Val Pro Asp				
510	515	520		
atg tac tcc gag ctg gtc aat cgt gtt ttc gca gtg ctc ccc gcg cca				1695
Met Tyr Ser Glu Leu Val Asn Arg Val Phe Ala Val Leu Pro Ala Pro				
525	530	535		
gac ggc gca acg ggc agt ttc ctc cta caa aac ctg ctg ggc gta tgg				1743

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Asp Gly Ala Thr Gly Ser Phe Leu Leu Gln Asn Leu Leu Gly Val Trp	
540 545 550	
ccc gcc gac ggc gtg atc acc gat gcg ctg cgc gat cga ttc agg gaa	1791
Pro Ala Asp Gly Val Ile Thr Asp Ala Leu Arg Asp Arg Phe Arg Glu	
555 560 565 570	
tac gcc cta aaa gct atc cgc gaa gca tcc aca aaa acc acg tgg gtg	1839
Tyr Ala Leu Lys Ala Ile Arg Glu Ala Ser Thr Lys Thr Thr Trp Val	
575 580 585	
gac ccc aac gag tcc ttc gag gct gcg gtc tgc gat tgg gtg gaa gcg	1887
Asp Pro Asn Glu Ser Phe Glu Ala Ala Val Cys Asp Trp Val Glu Ala	
590 595 600	
ctt ttc gac gga ccc tcc acc tca tta atc acc gaa ttt gtc tcc cac	1935
Leu Phe Asp Gly Pro Ser Thr Ser Leu Ile Thr Glu Phe Val Ser His	
605 610 615	
atc aac cgt ggc tct gtg aat atc tcc tta ggt agg aaa ctg ctg caa	1983
Ile Asn Arg Gly Ser Val Asn Ile Ser Leu Gly Arg Lys Leu Leu Gln	
620 625 630	
atg gtg ggc gct gga atc ccc gac act tac caa gga act gag ttt tta	2031
Met Val Gly Ala Gly Ile Pro Asp Thr Tyr Gln Gly Thr Glu Phe Leu	
635 640 645 650	
gaa gac tcc ctg gta gat ccc gat aac cga cgc ttt gtt gat tac acc	2079
Glu Asp Ser Leu Val Asp Pro Asp Asn Arg Arg Phe Val Asp Tyr Thr	
655 660 665	
gcc aga gaa caa gtc ctg gag cgc ctg caa acc tgg gat tgg acg cag	2127
Ala Arg Glu Gln Val Leu Glu Arg Leu Gln Thr Trp Asp Trp Thr Gln	
670 675 680	
gtt aat tcg gta gaa gac ttg gtg gat aac gcc gac atc gcc aaa atg	2175
Val Asn Ser Val Glu Asp Leu Val Asp Asn Ala Asp Ile Ala Lys Met	
685 690 695	
gcc gtg gtc cat aaa tcc ctc gag ttg cgt gct gaa ttt cgt gca agc	2223
Ala Val Val His Lys Ser Leu Glu Leu Arg Ala Glu Phe Arg Ala Ser	
700 705 710	
ttt gtt ggt gga gat cat cag gca gta ttt ggc gaa ggt cgc gca gaa	2271
Phe Val Gly Gly Asp His Gln Ala Val Phe Gly Glu Gly Arg Ala Glu	
715 720 725 730	
tcc cac atc atg ggc atc gcc cgc ggt aca gac cga aac cac ctc aac	2319
Ser His Ile Met Gly Ile Ala Arg Gly Thr Asp Arg Asn His Leu Asn	
735 740 745	
atc att gct ctt gct acc cgt cga cca ctg atc ttg gaa gac cgt ggc	2367
Ile Ile Ala Leu Ala Thr Arg Arg Pro Leu Ile Leu Glu Asp Arg Gly	
750 755 760	

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gga tgg tat gac acc acc gtc acg ctt cct ggt gga caa tgg gaa gac 2415
 Gly Trp Tyr Asp Thr Thr Val Thr Leu Pro Gly Gly Gln Trp Glu Asp
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 agg ctc acc ggg caa cgc ttc agt ggt gtt gtc cca gcc acc gat ttg 2463
 Arg Leu Thr Gly Gln Arg Phe Ser Gly Val Val Pro Ala Thr Asp Leu
 780 785 790
 ttc tca cat tta ccc gta tct ttg ttg gtt tta gta ccc gat agt gag 2511
 Phe Ser His Leu Pro Val Ser Leu Leu Val Leu Val Pro Asp Ser Glu
 795 800 805 810
 ttt tgatecctgc acaggaaagt tagcggcgct actatgaacg atcgatatgt 2564
 Phe
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<212> PRT

<213> Brevibacterium lactofermentum

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 Gln Ala Asp Ser Ala Gly Arg Phe Phe Gly Phe Ala Gln Ala Lys Ala
 20 25 30
 Gln Leu Pro Tyr Leu Lys Lys Leu Gly Ile Ser His Leu Tyr Leu Ser
 35 40 45
 Pro Ile Phe Thr Ala Met Pro Asp Ser Asn His Gly Tyr Asp Val Ile
 50 55 60
 Asp Pro Thr Ala Ile Asn Glu Glu Leu Gly Gly Met Glu Gly Leu Arg
 65 70 75 80
 Asp Leu Ala Ala Ala Thr His Glu Leu Gly Met Gly Ile Ile Ile Asp
 85 90 95
 Ile Val Pro Asn His Leu Gly Val Ala Val Pro His Leu Asn Pro Trp
 100 105 110
 Trp Trp Asp Val Leu Lys Asn Gly Lys Asp Ser Ala Phe Glu Phe Tyr
 115 120 125

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Phe Asp Ile Asp Trp His Glu Asp Asn Gly Ser Gly Gly Lys Leu Gly
 130 135 140
 Met Pro Ile Leu Gly Ala Glu Gly Asp Glu Asp Lys Leu Glu Phe Ala
 145 150 155 160
 Glu Leu Asp Gly Glu Lys Val Leu Lys Tyr Phe Asp His Leu Phe Pro
 165 170 175
 Ile Ala Pro Gly Thr Glu Glu Gly Thr Pro Gln Glu Val Tyr Lys Arg
 180 185 190
 Gln His Tyr Arg Leu Gln Phe Trp Arg Asp Gly Val Ile Asn Phe Arg
 195 200 205
 Arg Phe Phe Ser Val Asn Thr Leu Ala Gly Ile Arg Gln Glu Asp Pro
 210 215 220
 Leu Val Phe Glu His Thr His Arg Leu Leu Arg Glu Leu Val Ala Glu
 225 230 235 240
 Asp Leu Ile Asp Gly Val Arg Val Asp His Pro Asp Gly Leu Ser Asp
 245 250 255
 Pro Phe Gly Tyr Leu His Arg Leu Arg Asp Leu Ile Gly Pro Asp Arg
 260 265 270
 Trp Leu Ile Ile Glu Lys Ile Leu Ser Val Asp Glu Pro Leu Asp Pro
 275 280 285
 Arg Leu Ala Val Asp Gly Thr Thr Gly Tyr Asp Pro Leu Arg Glu Leu
 290 295 300
 Asp Gly Val Phe Ile Ser Arg Glu Ser Glu Asp Lys Phe Ser Met Leu
 305 310 315 320
 Ala Leu Thr His Ser Gly Ser Thr Trp Asp Glu Arg Ala Leu Lys Ser
 325 330 335
 Thr Glu Glu Ser Leu Lys Arg Val Val Ala Gln Gln Glu Leu Ala Ala
 340 345 350
 Glu Ile Leu Arg Leu Ala Arg Ala Met Arg Arg Asp Asn Phe Ser Thr
 355 360 365
 Ala Gly Thr Asn Val Thr Glu Asp Lys Leu Ser Glu Thr Ile Ile Glu
 370 375 380
 Leu Val Ala Ala Met Pro Val Tyr Arg Ala Asp Tyr Ile Ser Leu Ser
 385 390 395 400
 Arg Thr Thr Ala Thr Val Ile Ala Glu Met Ser Lys Arg Phe Pro Ser
 405 410 415
 Arg Arg Asp Ala Leu Asp Leu Ile Ser Ala Ala Leu Leu Gly Asn Gly
 420 425 430
 Glu Ala Lys Ile Arg Phe Ala Gln Val Cys Gly Ala Val Met Ala Lys
 435 440 445
 Gly Val Glu Asp Thr Thr Phe Tyr Arg Ala Ser Arg Leu Val Ala Leu

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450	455	460
Gln Glu Val Gly Gly Ala Pro Gly Arg Phe Gly Val Ser Ala Ala Glu		
465	470	475
Phe His Leu Leu Gln Glu Glu Arg Ser Leu Leu Trp Pro Arg Thr Met		480
	485	490
Thr Thr Leu Ser Thr His Asp Thr Lys Arg Gly Glu Asp Thr Arg Ala		495
	500	505
Arg Ile Ile Ser Leu Ser Glu Val Pro Asp Met Tyr Ser Glu Leu Val		510
	515	520
Asn Arg Val Phe Ala Val Leu Pro Ala Pro Asp Gly Ala Thr Gly Ser		525
	530	535
Phe Leu Leu Gln Asn Leu Leu Gly Val Trp Pro Ala Asp Gly Val Ile		540
	545	550
Thr Asp Ala Leu Arg Asp Arg Phe Arg Glu Tyr Ala Leu Lys Ala Ile		555
	565	570
Arg Glu Ala Ser Thr Lys Thr Thr Trp Val Asp Pro Asn Glu Ser Phe		575
	580	585
Glu Ala Ala Val Cys Asp Trp Val Glu Ala Leu Phe Asp Gly Pro Ser		590
	595	600
Thr Ser Leu Ile Thr Glu Phe Val Ser His Ile Asn Arg Gly Ser Val		605
	610	615
Asn Ile Ser Leu Gly Arg Lys Leu Leu Gln Met Val Gly Ala Gly Ile		620
	625	630
Pro Asp Thr Tyr Gln Gly Thr Glu Phe Leu Glu Asp Ser Leu Val Asp		635
	645	650
Pro Asp Asn Arg Arg Phe Val Asp Tyr Thr Ala Arg Glu Gln Val Leu		655
	660	665
Glu Arg Leu Gln Thr Trp Asp Trp Thr Gln Val Asn Ser Val Glu Asp		670
	675	680
Leu Val Asp Asn Ala Asp Ile Ala Lys Met Ala Val Val His Lys Ser		685
	690	695
Leu Glu Leu Arg Ala Glu Phe Arg Ala Ser Phe Val Gly Gly Asp His		700
	705	710
Gln Ala Val Phe Gly Glu Gly Arg Ala Glu Ser His Ile Met Gly Ile		715
	725	730
Ala Arg Gly Thr Asp Arg Asn His Leu Asn Ile Ile Ala Leu Ala Thr		735
	740	745
Arg Arg Pro Leu Ile Leu Glu Asp Arg Gly Gly Trp Tyr Asp Thr Thr		750
	755	760
Val Thr Leu Pro Gly Gly Gln Trp Glu Asp Arg Leu Thr Gly Gln Arg		765
	770	775
		780

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